

ATEUS[®] - STARGATE

Remote Control Unit (RCU)

User's Guide



Version: 3.0

CONTENTS

| | | |
|----------|--------------------------------------|-----------|
| 1 | INTRODUCTION..... | 3 |
| 1.1 | MANAGEMENT | 3 |
| 1.1.1 | Control | 3 |
| 1.1.2 | Monitoring..... | 3 |
| 1.2 | ACCOUNTING | 4 |
| 1.2.1 | Call Data Record (CDR)..... | 4 |
| 1.2.2 | Traces..... | 4 |
| 1.2.3 | Logs | 4 |
| 1.2.4 | Call statistics | 4 |
| 1.3 | EXTERNAL ROUTING | 4 |
| 2 | THE RCU SYSTEM | 6 |
| 2.1.1 | The basic system..... | 6 |
| 2.1.2 | The communication protocols | 6 |
| 2.1.3 | The Management Services Engines..... | 6 |
| 2.1.4 | The Management Databases | 7 |
| 3 | INSTALLATION | 8 |
| 3.1 | PRE-INSTALLATION | 8 |
| 3.1.1 | Topology..... | 8 |
| 3.1.2 | Assigning IP addresses..... | 8 |
| 3.2 | OS INSTALLATION | 9 |
| 3.2.1 | Installation procedure | 9 |
| 4 | CONFIGURATION | 10 |
| 4.1 | BASIC CONFIGURATION | 10 |
| 4.1.1 | E-mail alarms..... | 11 |
| 4.1.2 | SMS alarms | 11 |
| 4.1.3 | The Stargates..... | 11 |
| 4.1.4 | Network Address Translation..... | 12 |
| 4.1.5 | SNMP Configuration..... | 12 |
| 4.1.6 | Binding Stargates to databases | 13 |
| 4.1.7 | External routing | 14 |
| 4.2 | WEB CONFIGURATION | 14 |
| 4.3 | TESTING | 14 |
| 4.4 | CONFIGURATION EXAMPLE | 15 |
| 4.4.1 | IP map Table | 15 |
| 4.4.2 | Configuration | 16 |
| 4.4.3 | Web pass..... | 18 |
| 4.4.4 | Starting..... | 18 |
| 4.4.5 | Testing | 19 |
| 5 | RCU USAGE | 20 |
| 5.1 | WEB ACCESS | 20 |
| 5.1.1 | Welcome Message | 20 |
| 5.1.2 | Authentication | 21 |
| 5.1.3 | Web Overview | 21 |

| | | |
|----------|---|-----------|
| 5.1.4 | <i>Edit Parameters</i> | 24 |
| 5.2 | SNMP MANAGEMENT | 24 |
| 5.2.1 | <i>SNMP Queries</i> | 24 |
| 5.2.2 | <i>SNMP Traps</i> | 25 |
| 5.3 | ACCOUNTING | 25 |
| 6 | TROUBLESHOOTING | 27 |
| 6.1 | STARGATE SERVICE | 27 |
| 6.2 | STARGATE CONFIGURATION (SGCONF) | 27 |
| 6.3 | CHECKING THE DATABASES | 28 |
| 6.3.1 | <i>Stargate Databases</i> | 28 |
| 6.3.2 | <i>Stargate Terminal (sgterm)</i> | 28 |
| 6.3.3 | <i>Accessing table main</i> | 28 |
| 7 | FAQ | 31 |
| | APPENDIX 1: THE TRAP TABLE | 32 |

1 Introduction

Unlike most telecommunications devices that come with integrated remote management modules, the *ATEUS*® STARGATE (Stargate) comes with a Remote Control Unit (RCU), a standalone device offering a wider range of management and accounting capabilities.

1.1 Management

One RCU can manage up to eight Stargates.

1.1.1 Control

The RCU supports a number of methods for querying and or changing the Stargates' parameters:

- *Web interface*: From the common web browser, customers can alter configuration parameters in their Stargates on the fly (**Web configuration**).
- *Simple Network Management Protocol (SNMP)*: Designed to proxy Stargates to most commonly used network management software, The RCU allows clients to send legacy SNMP queries.
- *Secure AT shell*: The Stargate supports a set of AT commands. To send these commands to the Stargates remotely, one has to use telnet, an insecure remote login protocol. The RCU nails this problem such that, over the insecure Internet, telnet traffic is tunneled through Secure Shell (SSH) and only allowed in the LAN where the climate is relatively friendly. This allows clients to send configuration or query commands to the managed Stargates without having to worry that an evil cracker could be tapping the communication (see Fig.1).

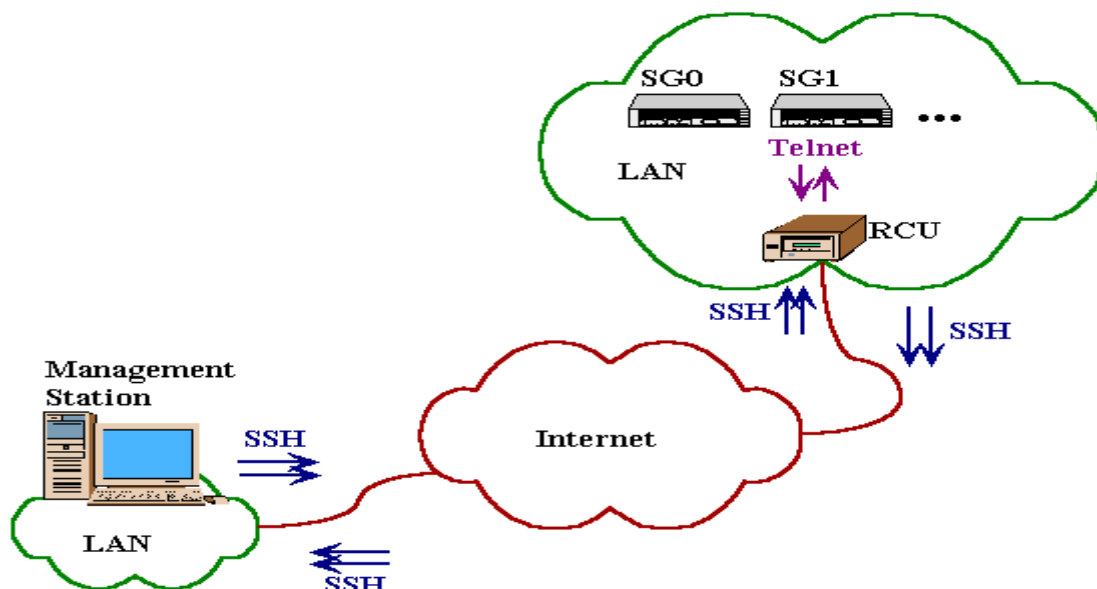


Fig.1: AT command tunneling over SSH

1.1.2 Monitoring

The RCU comes with a number of Stargate monitoring methods:

- *Web interface*: over the WWW, clients can monitor their Stargates while comfortably sitting in their offices. Occurrences of undesired (erroneous) conditions are promptly indicated by changes of color in the offending modules.
- *Simple Network Management System (SNMP)*: The RCU continuously monitors the attached Stargates and sends an SNMP trap every time a non standard status is observed
- *E-mail*: The RCU can be configured to send an email alarm in event that a Stargate or one of its components fails
- *SMS*: The RCU is also capable of sending an SMS alarm when so configured, to announce faults in the managed devices.

1.2 Accounting

The RCU is equipped with a number of databases and processes that collect and archive call accounting data

1.2.1 Call Data Record (CDR)

The RCU periodically collects CDRs from the Stargates and stores them in its local disk. This removes the risk that these records would be overwritten when the Stargate buffers are filled. These CDRs are accessible through the web.

1.2.2 Traces

The RCU automatically reroutes all the Stargate call traces to its local disk. These traces come in handy when troubleshooting a non standard status. They can also be accessed over the web.

1.2.3 Logs

The RCU also stores status logs on all the Stargate management applications. These are again useful when diagnosing management problems.

1.2.4 Call statistics

The RCU stores call summaries. These can be either overall or based on differed modules and SIM cards. The call statistics are readily available over the web

1.3 External Routing

The Stargate is equipped with an additional capability to route calls based on an external routing database – the so-called External Routing. This design opens the doors to the Stargate, to take advantage of the greater capacities of external routing databases as opposed to its limited internal routing buffers. The RCU, as we shall see, has a special database for this purpose. To use this special function, a routing database (LCR) has to be installed into the RCU. This database contains 9 tables named SGROUTE0-8. SGROUTE0 contains a list of numbers that have to be denied (blacklist). Each of the remaining 8 tables SGROUTE1-8 corresponds to the 8 groups configurable in the Stargate. These tables contain lists of numbers that will be routed through the corresponding groups in the Stargate, in other words, numbers contained in SGROUTE1 will be routed through group 1 in the Stargate etc.

External routing works in such a way that, when a call comes into the Stargate either from the PRI interface (SETUP) or from the GSM network (RING), the Stargate opens a telnet connection to the RCU and requests for instructions on how to route the call. This request is of the form ***ring: ch,cref,dial,clip** where:

- Ch – module number (0-31) or PRI channel 97-111 and 113-127 (timeslot +96)

- Cref – internal call reference number (1-255)
- Dial – called (destination) number
- Clip – callers (source) number

After receiving this message, the first thing the RCU does is that it compares “dial” against the numbers in SGROUTE0. If there is a match, then the call is rejected with a cause (AT^CR=ch, cref,cause). If on the other hand, “dial” passes this initial test, a search is mounted in the remaining 8 tables. The RCU returns immediately a match is found. The return value contains the group number through which the call will be routed in the Stargate (AT^RG=ch, cref, groups). This group number corresponds to the table number in which the hit was found. In the case that “dial” is not found in any of the 9 tables, the Stargate timesout and uses its internal LCR to route the call see Fig.2.

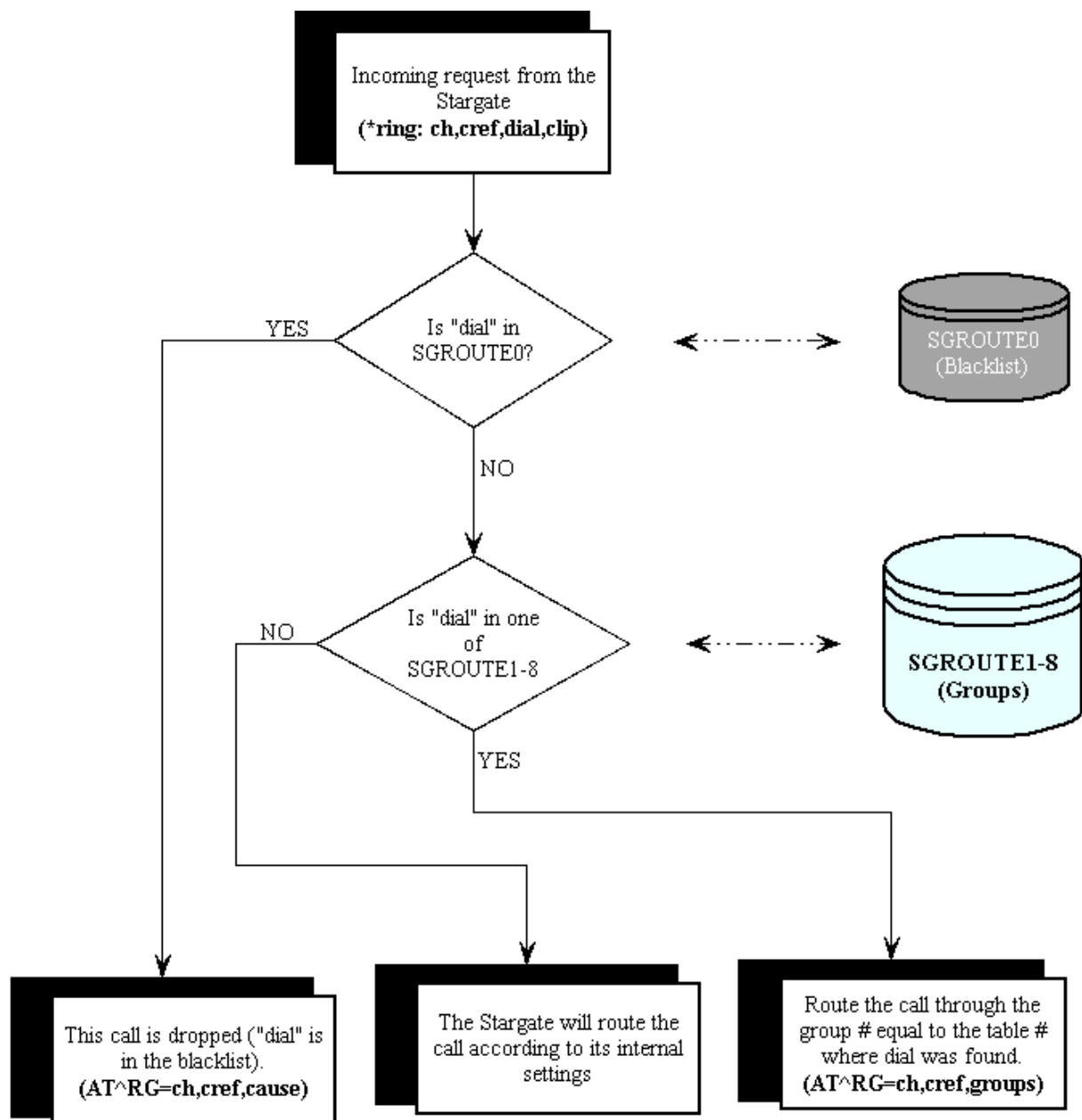


Fig. 2: External routing

2 The RCU System

2.1.1 The basic system

The RCU is made up of a powerful industrial PC running the Linux OS. Linux was specifically chosen to make the system relatively secure.

On top of the Linux OS are a web server (Apache), a database engine (Postgre) and a set of Stargate Management and Accounting applications.

2.1.2 The communication protocols

The RCU is equipped with two Ethernet cards usually Eth0 and Eth1. Eth1 connects to the managed Stargates' subnet. The RCU uses this interface to communicate with the Stargates by telnet or to send SMS in the event of a fault. This arrangement logically isolates the Stargates' subnet from the rest of the network and hence using telnet does not open security holes. Eth0 is intended to communicate to the rest of world without making it known that there are Stargates hidden on the other side of the wall! The protocols propagated through the firewall include:

- HTTP for web management
- SNMP to provide legacy network management functionality
- SSH for secure remote login
- SMTP sends an email if something happens (see Fig.3).

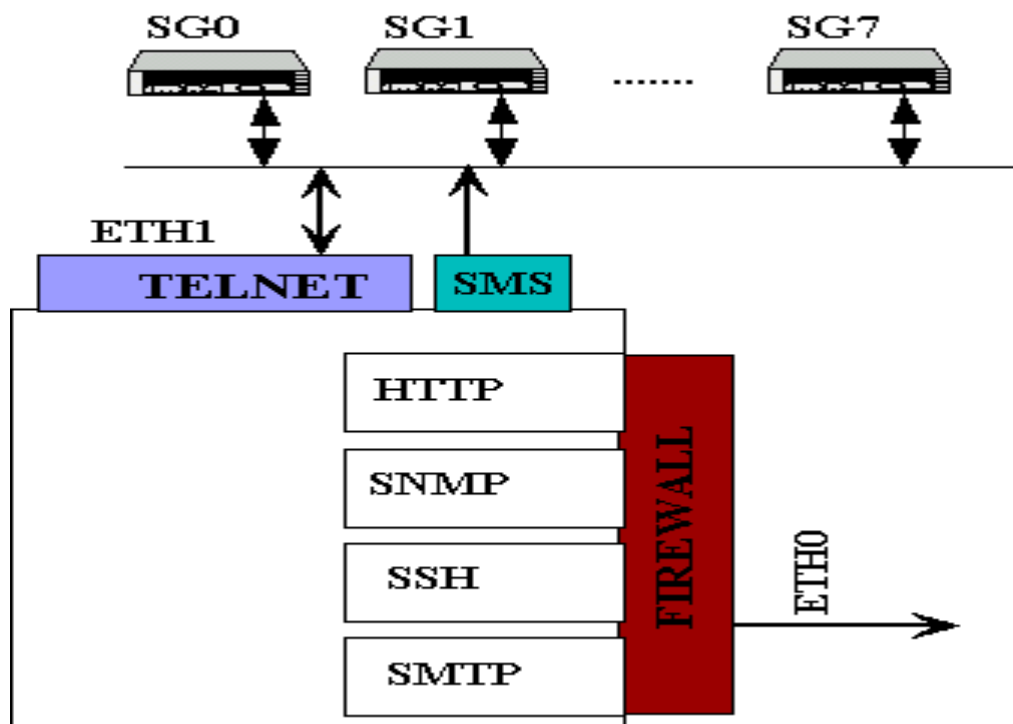


Fig.3: The RCU Protocols

2.1.3 The Management Services Engines

The RCU hosts a total of four management services:

- *Routing Service Engine (RSE)*: Serves for external routing

- *ISDN Trace Service Engine (ITSE)*: This engine is responsible for downloading ISDN traces
- *Status Service Engine (SSE)*: Responsible for periodically downloading statuses of the Stargates. If an undesired status is observed, the corresponding status alarm is generated.
- *SMS and E-mail Service Engine (SESE)*: This service can be invoked to send an alarm by either an SMS or e-mail

2.1.4 The Management Databases

- *Status Database (SDB)*: Actual Stargate statuses are stored here for each managed Stargate. These include databases Stargate0-7
- *ISDN traces, CDR and Log database (IC&LDB)*: Just as the name indicates, this DB stores ISDN traces, Call Data Records and Management application logs for the managed Stargates
- *Routing Database (RDB)*: Used by RSE for external routing purposes (see Fig. 4.)
- *Configuration database (CDB)*: This database is used for web configuration, a platform for configuring Stargate over the web.

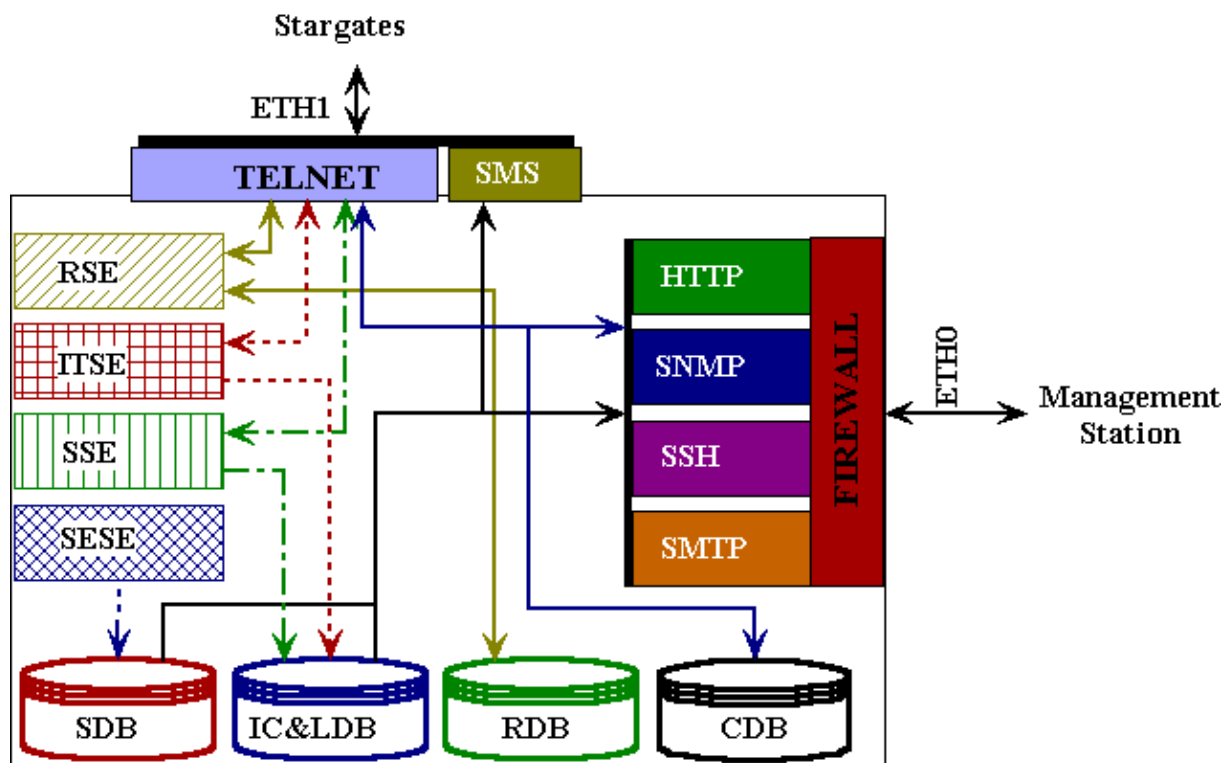


Fig.4: The RCU services and databases

3 Installation

3.1 Pre-installation

For a comprehensive and painless installation, a pre-installation preparation is mandatory.

3.1.1 Topology

The RCU can communicate with Stargates in any one of the following modes:

- *RS-232* serial communication through COM1&COM2. This mode can be used if at least one of the Stargates is within the proximity of the RCU. It is recommended that this mode be used when only one Stargate is to be managed by the RCU
- *Ethernet (10BaseT)*. There exists, as many logical network topologies, as there are network technicians. In the following chapter, only those parameters that a technician needs to know in order to either fit in the RCU into an existing network or to come up with a network for this purpose will be presented.

3.1.2 Assigning IP addresses

The RCU demands two logical sub-networks.

- *The Stargate sub-network (SG-SUBNET)*: Eth1 of the RCU and all the Stargates must belong to the SG-SUBNET. If different Stargates are placed in different logical network segments then you may consider implementing Network Address Translation (NAT) so that all the Stargates will appear to belong to the same network segment. Majority of network technicians put both Eth1 and the Stargates in to a private LAN (10.0.0.0, 192.168.0.0 etc.). The communication protocol in this segment is TELNET.
- *The Management sub-network (MNGMNT-SUBNET)*: Eth0 interface on the RCU is assigned an IP address from this segment. The management station must be reachable from Eth0. If traffic between RCU and the management station goes through a firewall, then, depending on the desired services the following protocols may need to be enabled:

| Application protocol | Transport Protocol | Port |
|----------------------|--------------------|---------|
| HTTPS | TCP | 443 |
| SSH | TCP | 22 |
| SNMP | UDP | 161,162 |
| SMTP | TCP | 25 |

Table1: Protocols to consider allowing through the Firewall

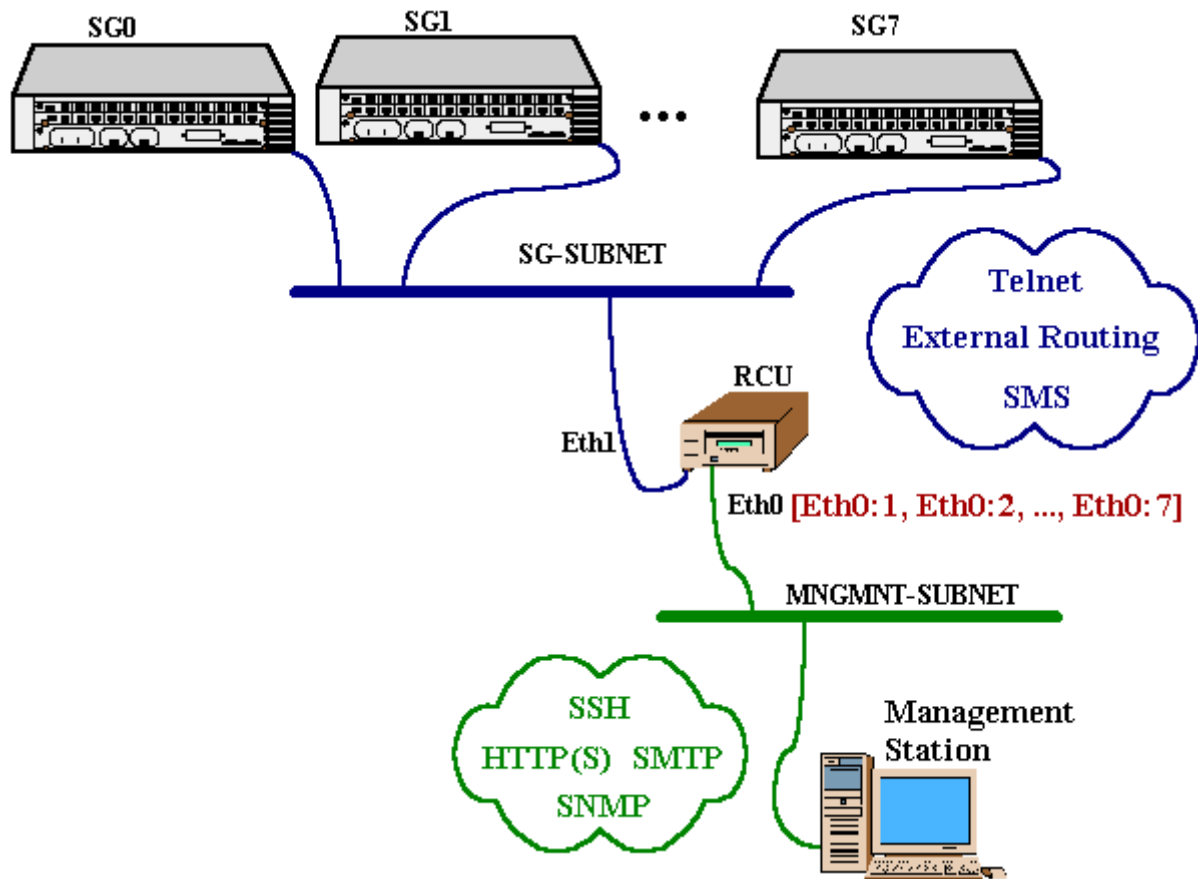


Fig.5: The RCU Topology

For each managed Stargate, the RCU runs a separate SNMP agent. Each running SNMP agent requires an IP address to communicate with the SNMP management node. Let us assume that our RCU will proxy eight Stargates (SG0, SG1, ..., SG7). The SNMP agent for SG0 will use Eth0 to communicate with the SNMP management node. The remaining seven SNMP agents (SG1 – SG7) will need seven additional IP addresses from the MNGMNT-SUBNET. These seven additional IP addresses are added as aliases to Eth0 (Eth0:1, Eth0:2, ..., Eth0:7) see Fig.5.

3.2 OS installation

3.2.1 Installation procedure

- Power the RCU
- Insert the RCU-CD into the CD-ROM
- Press Enter to Boot from the CD-ROM when prompted
- Type “y” to format the HD and to go on and install the RCU SW when prompted
- Wait for the system to eject the RCU-CD and press the “Reset” button to reboot the system. If you have gone this far, the OS is installed!
- Stand by for the system to reboot and press any key enter HW configuration. Please pass the screens picking the defaults, this will usually do, alternatively, tweak to taste!
- Type “root“ at the login prompt. “skakal pes pres oves++” is the default password.

4 Configuration

4.1 Basic configuration

Type *sgsetup* at the bash prompt to run the management software configuration script

```
bash-2.05a#  
bash-2.05a# sgsetup
```

The SGSETUP configuration script will guide you through the entire configuration process needed to set up the RCU. The text below will take us through the different options

Enter current date [07.08.2003]:
Today's date

Enter current time [15:01]:
The time now

eth0: IP address [192.168.100.100]:
IP address assigned the Eth0

eth0: Netmask [255.255.255.0]:
Subnet mask for the MNGMNT-SUBNET

eth0: Gateway [192.168.100.1]:
IP address of the gateway used to reach the network management station (not necessary if the RCU's Eth0 and the management station are in the same network segment)

eth1: IP address [192.168.10.2]:
IP address assigned to Eth1

eth1: Netmask [255.255.255.0]:
Subnet mask for the SG-SUBNET

SNMP trap IP address (1) [192.168.100.3]:
Management stations IP address

SNMP trap IP address (2) [192.168.100.3]:
Backup management station (The same management station can be used for redundancy)

SNMP community [public]:
Every device managed by SNMP must belong to an SNMP community (Public community is the default. The same community name must be set in the management node)

4.1.1 E-mail alarms

Enable e-mail sending? [YES]:

Answer yes (y) to enable e-mail alarms, no (n) disables this option

E-mail 'FROM' address [stargate@2n.cz]:

This entry acts as the sender (source) of the e-mail

E-mail 'TO' address [admins@2n.cz]:

You must enter the e-mail address of the Stargate monitoring crew here.

E-mail subject [Test]:

The e-mail alarm subject will always be set to this entry.

SMTP server address [10.254.1.254]:

Please be sure to enter your mail server's IP address (DO NOT USE YOUR MAIL SERVER'S HOST NAME, THE RCU DOES NOT USE DNS).

4.1.2 SMS alarms

Enable SMS sending? [YES]:

Answer yes (y) to enable alarm SMSs, no (n) disables this option

Destination phone number [+420737235896]:

SMS recipients GSM phone number

MS Center number [+420603052000]:

The provider's SMS center number. (Note: Provider's SMS center number is currently not implemented, please set a valid SMS center in the selected SIM card.)

SMS0 stargate device number (or type '-' to disable it) [7]:

SMS2 stargate device number (or type '-' to disable it) [-]:

SMS2 stargate device number (or type '-' to disable it) [-]:

The Stargate through which the SMS alarm is sent (one of 0 - 7 managed Stargates). Up to three different Stargates can be used for this purpose. Typing “-“ disables the particular choice.

SMS0 module number [2]:

SMS1 module number [2]:

SMS2 module number [2]:

The GSM module from which the SMS alarm is sent, Three GSM modules can be set, they must belong to the Stargates selected above.

4.1.3 The Stargates

At this stage, we configure the Stargates to be managed by the RCU. For each Stargate, five parameters have to be configured as shown below. These five items have to be repeatedly configured a number of times equal to the number of Stargates. The Stargates are numbered from zero, so that, if for example we have eight Stargates, they will be numbered from 0 through 7. This same order will be used to map the Stargates to the different databases and storage tables. It is therefore mandatory to maintain the same Stargate numbering as the one that comes with the RCU CD.

ATTENTION: SWAPPING CPU CARDS BETWEEN STARGATES IS NOT POSSIBLE BECAUSE INDIVIDUAL STARGATES ARE BOUND TO THEIR DATABASES BY THE SERIAL NUMBERS OF THEIR CPUS!

THE RCU HAS BEEN TESTED TO WORK RELIABLY WITH UP TO EIGHT STARGATES. MORE THAN EIGHT STARGATES CAN ONLY BE CONFIGURED AT USER'S RISK.

Enable StarGate #0 ? [YES]:

Enter yes (y) to enable the first Stargate. If SNMP will be used to manage this Stargate then it will be automatically bound to Eth0. No (n) disables Stargate #0

Enable StarGate LCR #0 ? [YES]:

Yes (y) switches on External Routing, No (n) turns it off

Enter StarGate #0 IP address or '-' [192.168.10.3]:

This parameter has a number of meanings. The first is that we choose the mode of communication. By entering „-“ (dash) we tell the RCU that it will communicate with Stargate #0 through the serial ports (COM1 and COM2). Make sure that Stargate #0 is connected to the RCU by serial cables (Stargate COM1 to RCU COM1 and Stargate COM2 to RCU COM 2). Only one Stargate can use this form of communication. If however, the RCU will use Ethernet to communicate with Stargate #0 then this is the right place to enter Stargate #0's IP address.

Enter StarGate #0 user name [2n]:

Enter StarGate #0 user password [2n]:

If Ethernet is enabled as above, it is mandatory to configure username and password. The username and password entered here must be the same as the username and password configured in the Stargate, the Stargate will otherwise reject telnet sessions from the RCU. (Username and password are case sensitive!)

These same parameters must be repeatedly set for all the Stargates managed by the RCU (Stargate #1 though Stargate #7). See the Example configuration in the next section.

4.1.4 Network Address Translation

A classical Network Address Translation (NAT) is applied here to map the SNMP IP addresses configured on Eth0 (Eth0, Eth0:1, ... Eth0:7) to the IP addresses of the Stargates usually reachable from Eth1. This parameter can be safely turned off if SNMP will not be used for management.

Enable network address translation? [YES]:

Yes (y) turns on NAT, no (n) turns it off

4.1.5 SNMP Configuration

IP address of SNMP agent #0: 192.168.20.100

Each managed Stargate has a separate SNMP agent whose task is to proxy the specific Stargate to the network management node. Each of these SNMP agents uses the IP addresses set on Eth0. See table below.

| Interface | Agent | Stargate |
|-----------|----------|-------------|
| Eth0 | agent #0 | Stargate #0 |
| Eth0:1 | agent #1 | Stargate #1 |
| Eth0:2 | agent #2 | Stargate #2 |
| . | . | . |
| . | . | . |
| Eth0:n | agent #n | Stargate #n |

Table2: Interface, SNMP agent and Stargate Mapping

Stargate #0 is automatically bound to Eth0, which is already configured. Stargates #1 through n have to be manually assigned SNMP IP addresses, these are the IP addresses made for Eth0:1 through Eth0:n, n is the number of Stargates to be managed by the RCU minus 1, the maximum value n can take is 7.

4.1.6 Binding Stargates to databases

Stargate CPUs are usually bound to the RCU databases before shipping. In this case no additional binding is required. It may happen however, that the RCU and the Stargates are shipped separately or that a customer decides to buy additional Stargates and therefore pre-shipment binding is not done. This subsection is devoted to binding Stargate CPUs to the RCU databases when this becomes necessary.

For each Stargate CPU that has not already been bound to a database in the RCU, 3 digit strings are provided at the back of the RCU CD, Please prepare this strings for each Stargate and follow the procedure below.

- Run “chcpusn”

```
bash-2.05a#
```

```
bash-2.05a# chcpusn
```

Enter number of database (0 7)

Pick a database for this Stargate, it must be free (not previously allocated to another Stargate).

Enter 1. string:

Enter the first string for this Stargate

Enter 2. string:

Enter the second string for this Stargate

Enter 3. string:

Enter the third string for this Stargate

- Test database to Stargate CPU binding

```
bash-2.05a#
```

```
bash-2.05a# sgterm n “ati4”
```

The output of this AT command is the CPU serial number of the Stargate bound to database number n (If we chose 5 in *Enter number of database (0 7)* above, then use ‘sgterm 5 “ati4”’ to retrieve the CPU serial number for the database Stargate5 and compare it with the one given at the back of the RCU CD).

4.1.7 External routing

Before external routing can be activated, the RCU has to be prepared for this. Please follow the following steps to prepare the RCU for external routing.

- Edit the text file */var/local/stargate/routing_list.txt*. This file comes with a default configuration, which is usually not usable; please edit this file so that the first column contains the list of dialed numbers. The second column must contain the target groups through which the Stargate will route the calls. Use groups 1-8 for calls that will be routed. Numbers that will be blocked should have 0 in the second column. Be sure to follow the format in the default file.
- Run “sgrt”

bash-2.05a#

bash-2.05a# sgrt

This script uploads the contents of *routing_list.txt* in to the appropriate tables in the routing database. Any duplicate entries are removed during this operation. Before you consider using external routing, make sure you have a fast Ethernet connection between the Stargate and the RCU.

4.2 Web configuration

All the Stargates are now available on the web. Only authorized users can however access this information. To be able to access the individual Stargates over the web, we will need to create a web username and password for each managed Stargate. You are advised to set the same username and password for all the Stargates to avoid errors during automatic actualization.

bash-2.05a#

At the bash prompt, type ‘webpass’ to invoke the web password configuration script

bash-2.05a# webpass

Stargate num.:

Enter the Stargate Number (0 through n)

Username:

New password:

Re-type new password:

The username and password for the Stargate number set above.

This procedure has to be repeated n times to have all n Stargates accessible over the web.

4.3 Testing

The first thing to do after configuration is to restart the Stargates services. This forces them to re-read the current configuration files.

```
bash-2.05a#
```

```
bash-2.05a# service stargate restart
```

To troubleshoot the Stargate service use the commands "service stargate status " and „sgconf“ for further information, see the example in the next section.

4.4 Configuration Example

Refer to Fig. 6

4.4.1 IP map Table

| Stargate | Stargate IP address | Interface | Interface IP address | Interface Use |
|----------|---------------------|-----------|----------------------|----------------------------|
| SG0 | 192.168.10.2 | Eth0 | 192.168.20.2 | SNMP SG0, SSH, SMTP, HTTPS |
| SG1 | 192.168.10.3 | Eth0:1 | 192.168.20.3 | SNMP SG1 |
| SG2 | 192.168.10.4 | Eth0:2 | 192.168.20.4 | SNMP SG2 |
| SG3 | 192.168.10.5 | Eth0:3 | 192.168.20.5 | SNMP SG3 |
| SG4 | 192.168.10.6 | Eth0:4 | 192.168.20.6 | SNMP SG4 |
| SG5 | 192.168.10.7 | Eth0:5 | 192.168.20.7 | SNMP SG5 |
| SG6 | 192.168.10.8 | Eth0:6 | 192.168.20.8 | SNMP SG6 |
| SG7 | 192.168.10.9 | Eth0:7 | 192.168.20.9 | SNMP SG7 |
| | | Eth1 | 192.168.10.1 | Telnet, HTTPS, SMS |

Table3: IP address and protocol plan

Default gateway 192.168.20.1, Management Station 192.168.30.5

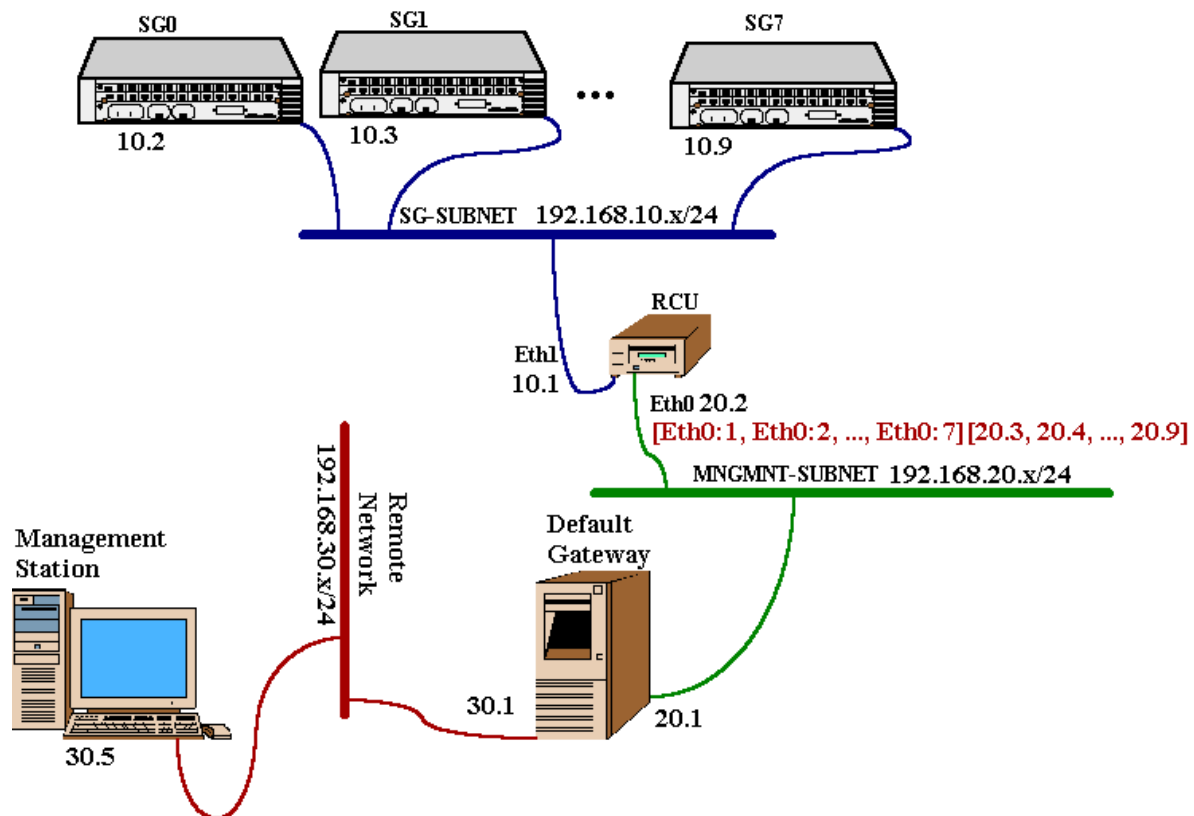


Fig. 6: An example configuration.

4.4.2 Configuration

```
bash-2.05a#
```

```
bash-2.05a# sgsetup
```

```
Enter current date [07.08.2003]: 09.08.2003
```

```
Sat Aug 9 00:00:00 CEST 2003
```

```
Enter current time [15:01]: 21.33
```

```
Sat Aug 9 21:33:00 CEST 2003
```

```
Date and time are updated.
```

```
eth0: IP address [192.168.100.100]: 192.168.20.2
```

```
eth0: Netmask [255.255.255.0]: 255.255.255.0
```

```
eth0: Gateway [192.168.100.1]: 192.168.20.1
```

```
eth1: IP address [192.168.10.2]: 192.168.10.1
```

```
eth1: Netmask [255.255.255.0]: 255.255.255.0
```

```
SNMP trap IP address (1) [192.168.100.3]: 192.168.30.5
```

```
SNMP trap IP address (2) [192.168.100.3]: 192.168.30.5
```

```
SNMP community [public]: Buster
```

```
Configuring network interface eth0 ...
```

```
Configuring network interface eth1 ...
```

```
Enable e-mail sending ? [YES]: y
```

```
E-mail 'FROM' address [stargate@2n.cz]: romote-tower@control-center.com
```

```
E-mail 'TO' address [ryba@2n.cz]: watch-tower@control-center.com
```

```
E-mail subject [Test]: Stargate watch
```

SMTP server address [10.254.1.254]: 192.168.30.2

Enable SMS sending ? [YES]: y

Destination phone number [+420737235896]: +420900333777

SMS Center number [+420603052000]: +420900600000

SMS0 stargate device number (or type '-' to disable it) [7]: 1

SMS0 module number [2]: 3

SMS1 stargate device number (or type '-' to disable it) [-]: 3

SMS1 module number [2]: 5

SMS2 stargate device number (or type '-' to disable it) [-]: 5

SMS2 module number [2]: 7

Enable StarGate #0 ? [YES]: y

Enable StarGate LCR #0 ? [YES]: n

Enter StarGate #0 IP address or '-' [192.168.10.3]: 192.168.10.2

Enter StarGate #0 user name [2n]: spinner

Enter StarGate #0 user password [2n]: secrets

Enable StarGate #1 ? [YES]: y

Enable StarGate LCR #1 ? [YES]: n

Enter StarGate #1 IP address or '-' [192.168.10.10]: 192.168.10.3

Enter StarGate #1 user name [2n]: spinner

Enter StarGate #1 user password [2n]: secrets

Enable StarGate #2 ? [YES]: y

Enable StarGate LCR #2 ? [YES]: n

Enter StarGate #2 IP address or '-' [192.168.10.6]: 192.168.10.4

Enter StarGate #2 user name [2n]: spinner

Enter StarGate #2 user password [2n]: secrets

Enable StarGate #3 ? [YES]: y

Enable StarGate LCR #3 ? [YES]: n

Enter StarGate #3 IP address or '-' [192.168.10.7]: 192.168.10.5

Enter StarGate #3 user name [2n]: spinner

Enter StarGate #3 user password [2n]: secrets

Enable StarGate #4 ? [YES]: y

Enable StarGate LCR #4 ? [YES]: n

Enter StarGate #4 IP address or '-' [192.168.10.7]: 192.168.10.6

Enter StarGate #4 user name [2n]: spinner

Enter StarGate #4 user password [2n]: secrets

Enable StarGate #5 ? [YES]: y

Enable StarGate LCR #5 ? [YES]: n

Enter StarGate #5 IP address or '-' [192.168.10.7]: 192.168.10.7

Enter StarGate #5 user name [2n]: spinner

Enter StarGate #5 user password [2n]: secrets

Enable StarGate #6 ? [YES]: y

Enable StarGate LCR #6 ? [YES]: n

Enter StarGate #6 IP address or '-' [192.168.10.7]: 192.168.10.8

Enter StarGate #6 user name [2n]: spinner

Enter StarGate #6 user password [2n]: secrets

Enable StarGate #7 ? [YES]: y

Enable StarGate LCR #7 ? [YES]: n

Enter StarGate #7 IP address or '-' [192.168.10.7]: 192.168.10.9

Enter StarGate #7 user name [2n]: spinner

Enter StarGate #7 user password [2n]: secrets

Enable network address translation ? [YES]: *y*

IP address of SNMP agent #0: 192.168.20.2
IP address of SNMP agent #1 [192.168.100.101]: *192.168.20.3*
IP address of SNMP agent #2 [192.168.100.102]: *192.168.20.4*
IP address of SNMP agent #3 [192.168.100.103]: *192.168.20.5*
IP address of SNMP agent #4 [192.168.100.104]: *192.168.20.6*
IP address of SNMP agent #5 [192.168.100.105]: *192.168.20.7*
IP address of SNMP agent #6 [192.168.100.106]: *192.168.20.8*
IP address of SNMP agent #7 [192.168.100.107]: *192.168.20.9*

Configuring network interface eth0:1 ...
Configuring network interface eth0:2 ...
Configuring network interface eth0:3 ...
Configuring network interface eth0:4 ...
Configuring network interface eth0:5 ...
Configuring network interface eth0:6 ...
Configuring network interface eth0:7 ...
Setting firewall...
Saving new firewall configuration...
Finished.
bash-2.05a#

4.4.3 Web pass

bash-2.05a#
bash-2.05a# *webpass*
Stargate num.: *0*
Username: *stargateguru*
New password: *topsecret*
Re-type new password: *topsecret*

Updating password for user stargateguru

bash-2.05a#
bash-2.05a# *webpass*
Stargate num.: *1*
Username: *stargateguru*
New password: *topcecret*
Re-type new password: *topsecret*

Updating password for user stargateguru

etc

4.4.4 Starting

bash-2.05a#
bash-2.05a# *service stargate restart*

| | |
|---|-------------------|
| Shutting down StarGate SNMP daemon: | [OK] |
| Shutting down StarGate Agent: | [OK] |
| Shutting down StarGate Trace Logger: | [OK] |
| Shutting down StarGate Least Cost Routing: | [FAILED] |
| Shutting down StarGate Network Server: | [OK] |
| Starting StarGate SNMP daemon #0 | [OK] |
| Starting StarGate Network Server #0 | [OK] |
| Starting StarGate Agent #0 | [OK] |
| Starting StarGate Trace Logger #0 | [OK] |

| | |
|--|---------------|
| Starting StarGate SNMP daemon #1 | [OK] |
| Starting StarGate Network Server #1 | [OK] |
| Starting StarGate Agent #1 | [OK] |
| Starting StarGate Trace Logger #2 | [OK] |
| Starting StarGate SNMP daemon #2 | [OK] |
| Starting StarGate Network Server #2 | [OK] |
| Starting StarGate Agent #2 | [OK] |
| Starting StarGate Trace Logger #2 | [OK] |
| Starting StarGate SNMP daemon #3 | [OK] |
| Starting StarGate Network Server #3 | [OK] |
| Starting StarGate Agent #3 | [OK] |
| Starting StarGate Trace Logger #3 | [OK] |

4.4.5 Testing

bash-2.05a#

bash-2.05a# **service stargate status**

snmpd (pid 16705 16645) is running...
 sgagent (pid 16734 16671) is running...
 sgtrace (pid 16746 16682) is running...
 sglcr is stopped
 sgethsvr (pid 16722 16660) is running...

bash-2.05a#

bash-2.05a# **sgconf**

```
StarGate #0:  YES - 192.168.10.2
StarGate #1:  YES - 192.168.10.3
StarGate #2:  YES - 192.168.10.4
StarGate #3:  YES - 192.168.10.5
StarGate #4:  YES - 192.168.10.6
StarGate #5:  YES - 192.168.10.7
StarGate #6:  YES - 192.168.10.8
StarGate #7:  YES - 192.168.10.9
StarGate #8:  NO
StarGate #9:  NO
```

```
startage 0: OK
startage 1: OK
startage 2: OK
startage 3: OK
startage 4: OK
startage 5: OK
startage 6: OK
startage 7: OK
startage 8: DISABLED
startage 9: DISABLED
```

5 RCU Usage

The RCU can be used in a number of ways as has already been explained in the previous chapters. In the following sections, we will explore methods of retrieving and interpreting the management and accounting data gathered by the RCU.

5.1 Web access

To access the managed Stargates over the web, open your favorite web browser and for the URL type <http://IPaddress>. If, as in our example, the IP address of Eth0 is 192.168.20.2, then the URL would be <http://192.168.20.2>. Note that the IP address can be any one of Eth0, Eth1 or any of the aliases depending on the reachability of the RCU from the control station.

5.1.1 Welcome Massage

The first page that comes up contains a welcome message and two button columns for each of the eight manageable Stargates (Stargate 0-7).

The two button columns are a 'Web Overview' column for web monitoring of each Stargate and an 'Edit Parameters' column.

Clicking on any of the buttons will take us to a login dialogue if we are not already logged in (see Fig. 7&8).

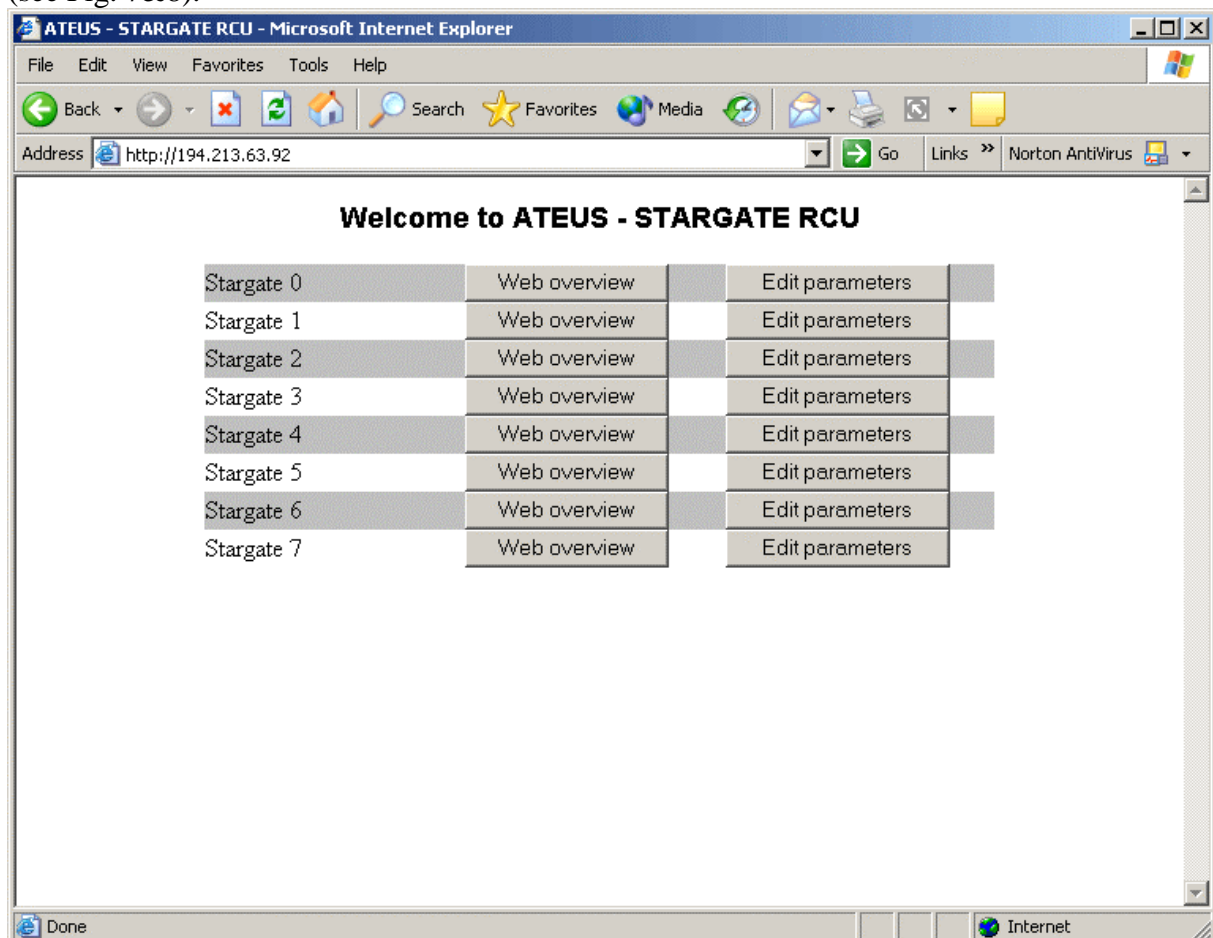


Fig.7: Web access welcome page

5.1.2 Authentication

Here, it is enough to type the username and password configured in the RCU with the 'webpass' command. Let us visit the 'Web Overview' first (Fig.9).

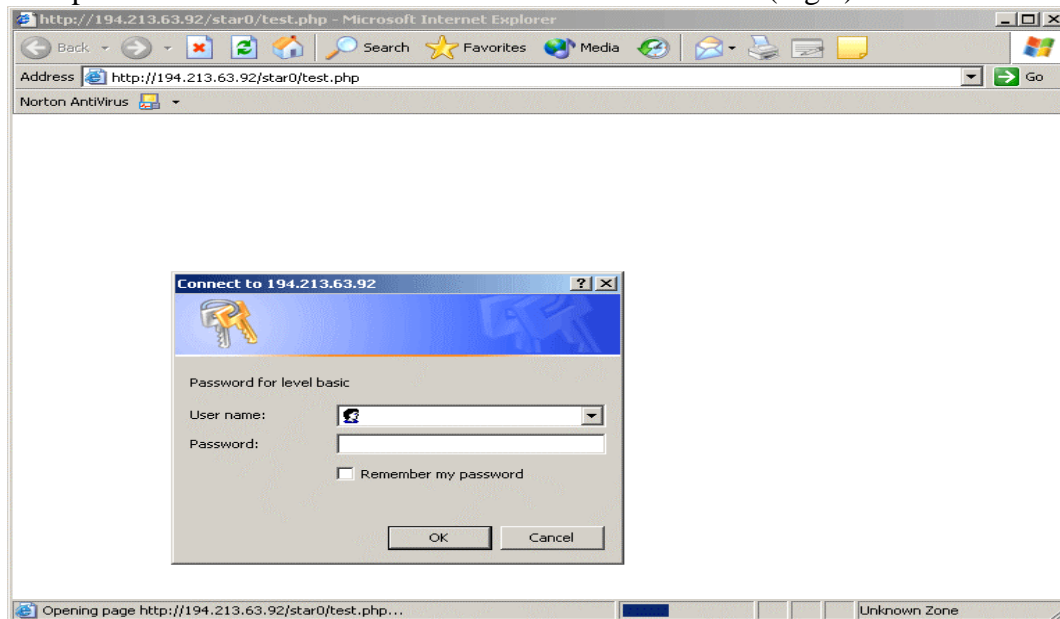


Fig.8: Web login dialogue

5.1.3 Web Overview



Fig.9: Web Overview

The Web Overview is the main monitoring page as can be seen in the Fig.9. On the lower part is the front view of the Stargate. Counting from right, we have the power supply, the CPU card, the AUX card, the PRI card and 16 GSM cards. When something happens to any of the cards, the card color changes from gray to red. If we however put one of the GSM modules to 'sleep' or 'block' mode, the corresponding card turns yellow (Fig. 10). This page refreshes automatically every 20 seconds so that any faults investing the Stargate are diagnosed in 20 seconds latest. Please consult the Stargate manual for more information.

At the top mid-left, we have a blue bubble button with a white pointer and half surrounded by little spherical buttons, the first of which is green and the rest are blue. Immediately below this cluster is a rectangular screen with 'Serial Number:' and 'M111-2-150-15' on display. This part of the menu contains the System Settings as configured with the Stargate program. Each of the little spherical buttons represents an item of the System Settings menu. Clicking on any one of them not only toggles the white pointer to point to the selected button, but also, the corresponding System Settings menu item is displayed on the screen.

On the immediate left of the blue bubble button are three additional buttons. These buttons are yours for the clicking. The left most button actualizes the web overview page. Click the middle button to display call statistics (Fig.11). The right most button is used for downloading CDRs and ISDN PRI traces (Fig.12).

Finally, at the top right we have a stopwatch like button with a green display in the middle. Clicking on one of the triangular buttons below the display will toggle either the date or the time in the Stargate.



Fig.10: Error conditions

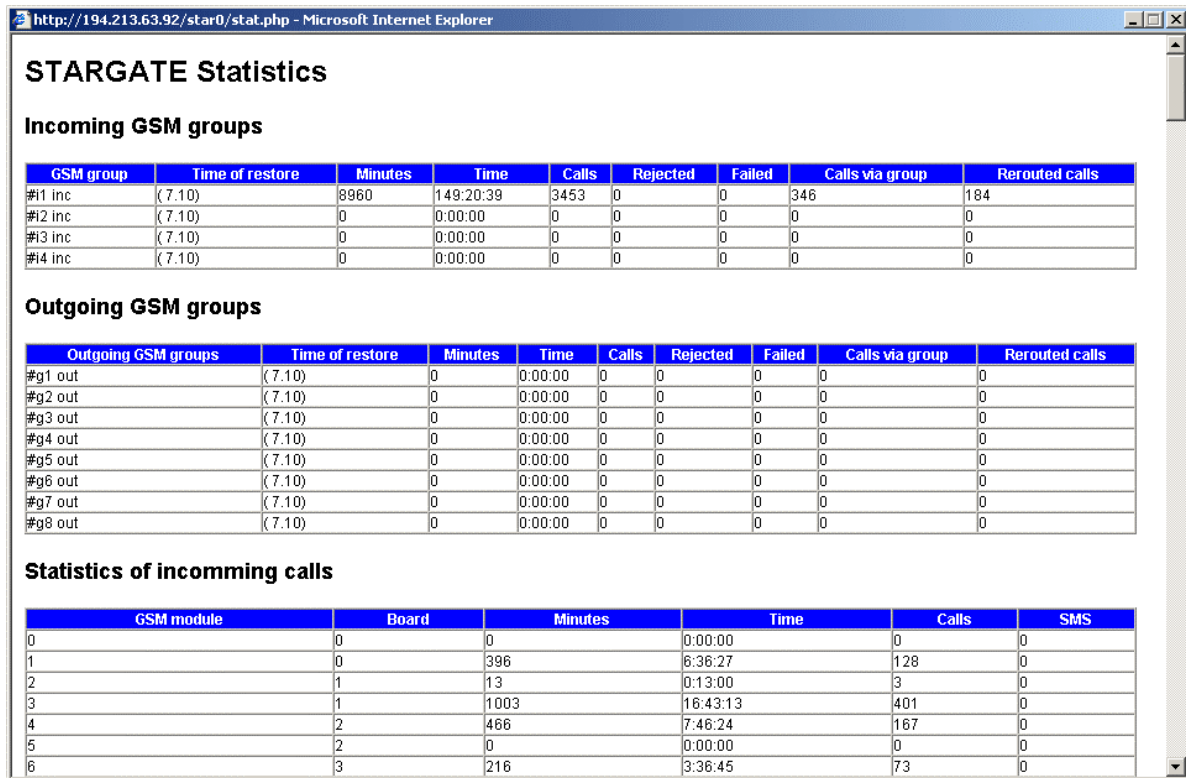


Fig.11: Stargate statistics

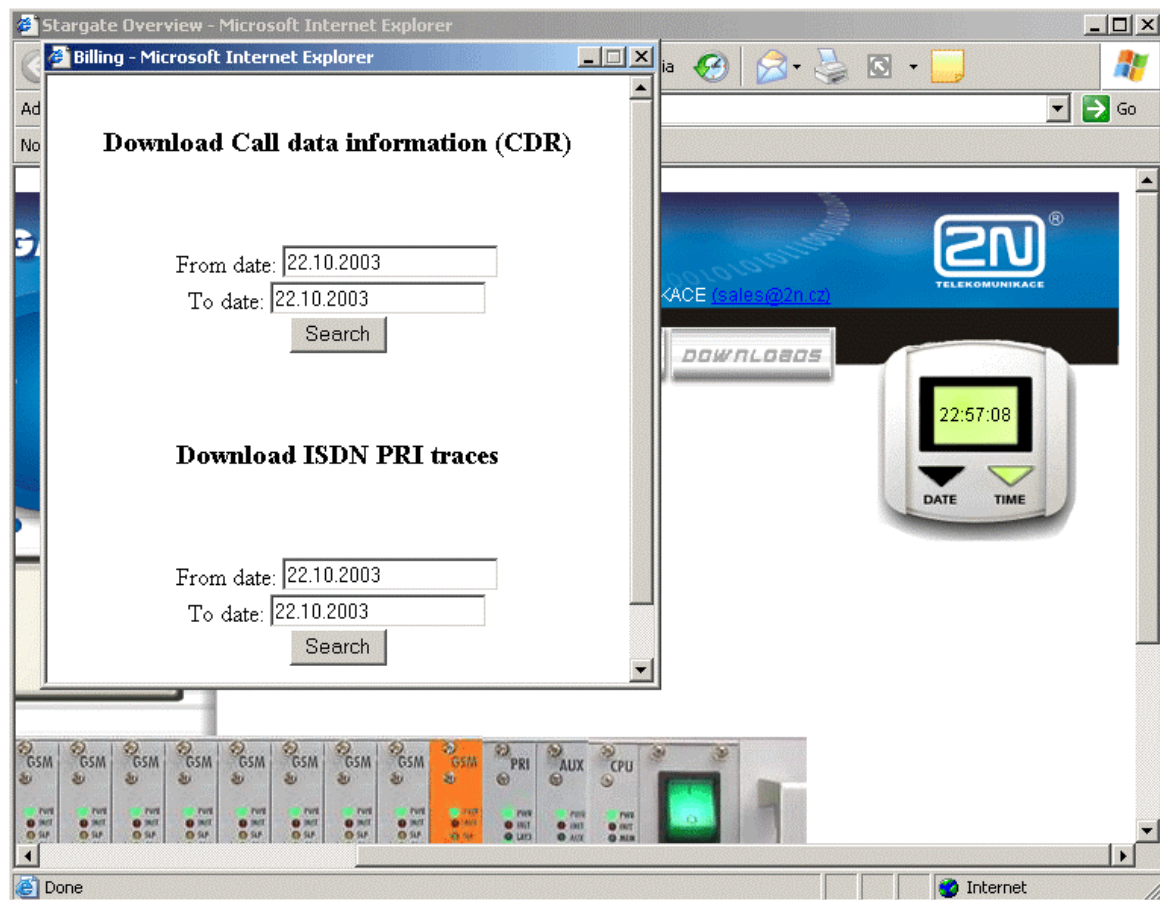


Fig.12: CDR and Trace download

5.1.4 Edit Parameters

This item, which is recommended only for trained technicians, is intended for the configuration of the Stargate over the web. If you are not sure of what you are doing please do not use this page. To modify the Stargate configuration through the web interface, please follow these 3 simple steps

- Make the desired changes on the web interface
- Click “Save settings” to send the changes to the database in the RCU
- Click “Send settings to the STARGATE unit” to load the setting from the database into the Stargate.

Please note that these steps have to be repeated on each page.

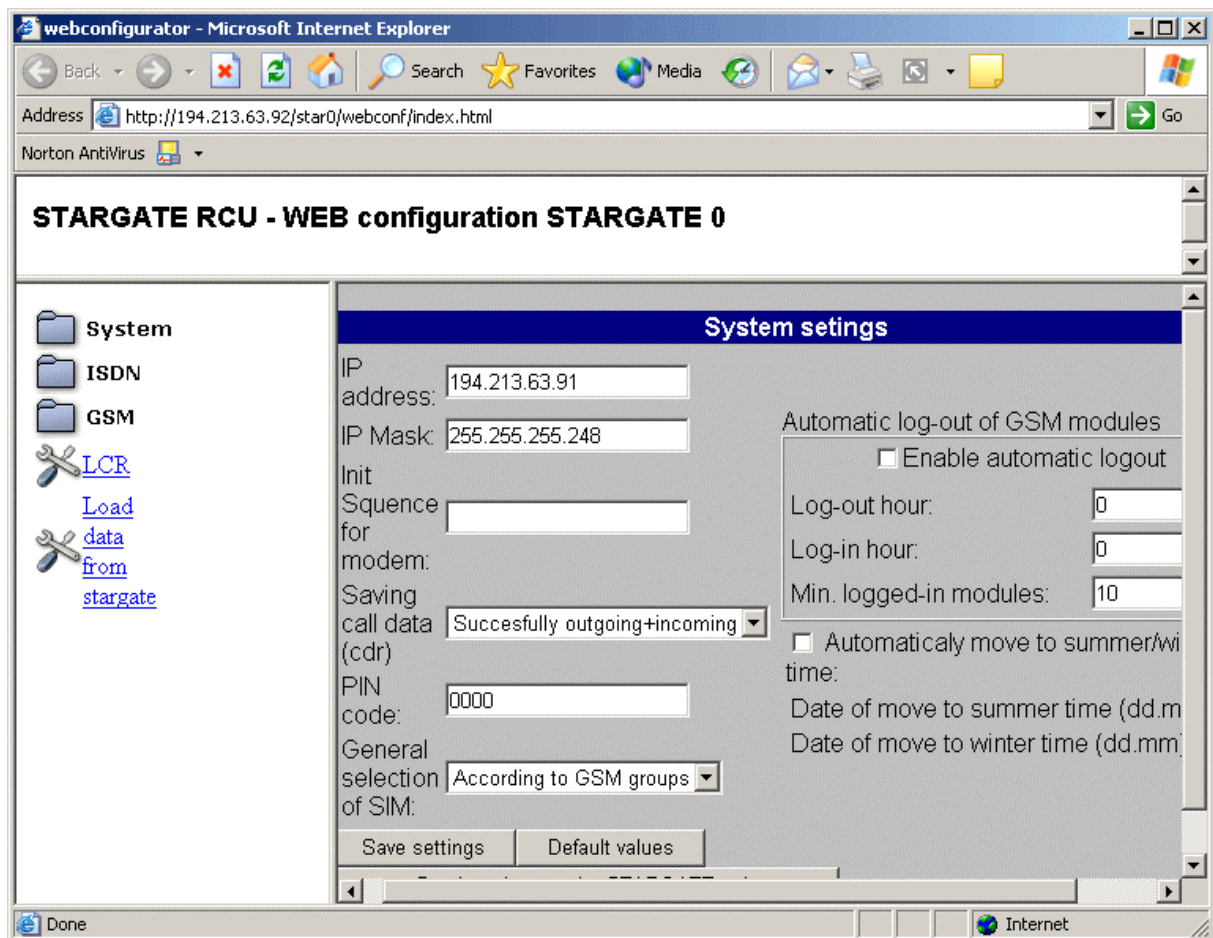


Fig.13: Web configuration

5.2 SNMP Management

Users operating a network management system either locally or by outsourcing can readily incorporate the RCU in to their network management software (HP OpenView, Tivoli, Netcool ... etc) and enjoy the convenient services of the SNMP protocol.

5.2.1 SNMP Queries

The Stargate MIB has to be properly installed in the Network Management Node (NMN). This installation is beyond the scope of this manual (help can be sought from the 2N technical

support stuff). When all is installed, SNMP queries can be send from the NMN to the RCU on all the SNMP objects in the Stargate MIB. Different Stargates are represented by their SNMP IP addresses (Eth0, Eth0:1, ..., Eth0:n).

5.2.2 SNMP Traps

Immediately after configuration, the RCU begins to send event driven alarms to announce changes in the different statuses of the Stargate. Each trap is again identified by the source address, which corresponds to the SNMP IP address of the respective Stargate (Fig.14)

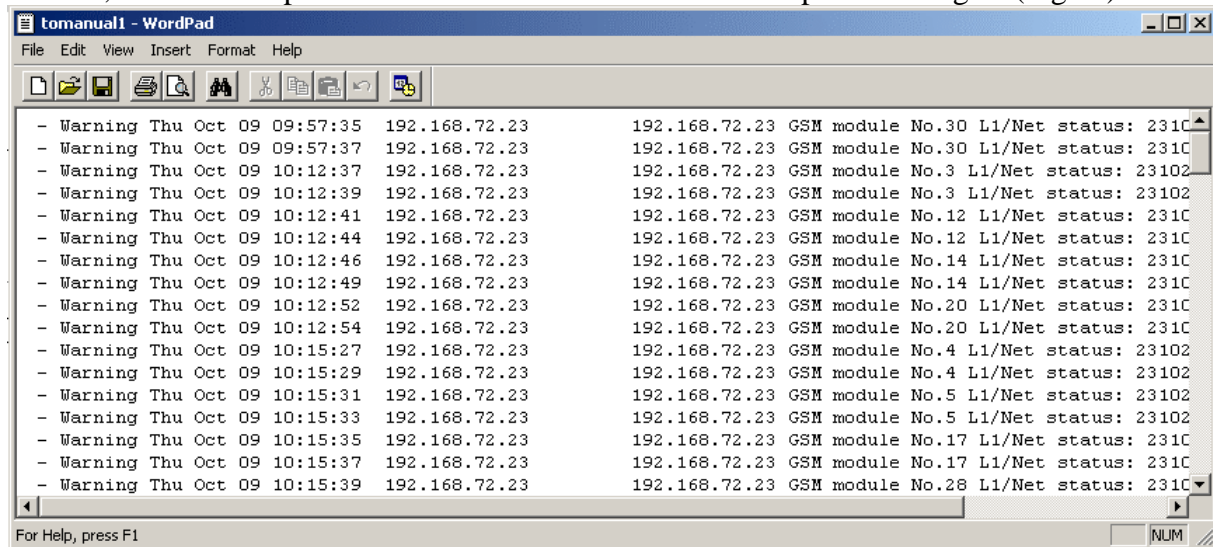


Fig.14: RCU alarms (traps)

5.3 Accounting

Besides Stargate management, the RCU collects different accounting information. This information can be thereafter retrieved at the discretion of the user in two ways. The first method employs the web interface as has already been mentioned in section 5.1.3. In the second method, we use a Secure Shell (SSH) client to download the accounting data directly from the RCU. All accounting information for individual Stargates is stored in the **/var/log** directory (Fig. 15). If you, for example, wish to retrieve accounting information on Stargate 0, please connect to the RCU by SSH and move to **/var/log/stargate0**. This directory contains specific accounting information for Stargate 0. Billing information (CDR) is stored in files of the form **b-yyyy-mm-dd.log**. An example is **b-2003-09-18.log** i.e. the CDR for 18th of September 2003. The other useful information is found in the trace files. They too have a similar format **t-yyyy.mm.dd.log**. You will find a lot of other information useful for troubleshooting when something goes wrong. These include logs and error messages.

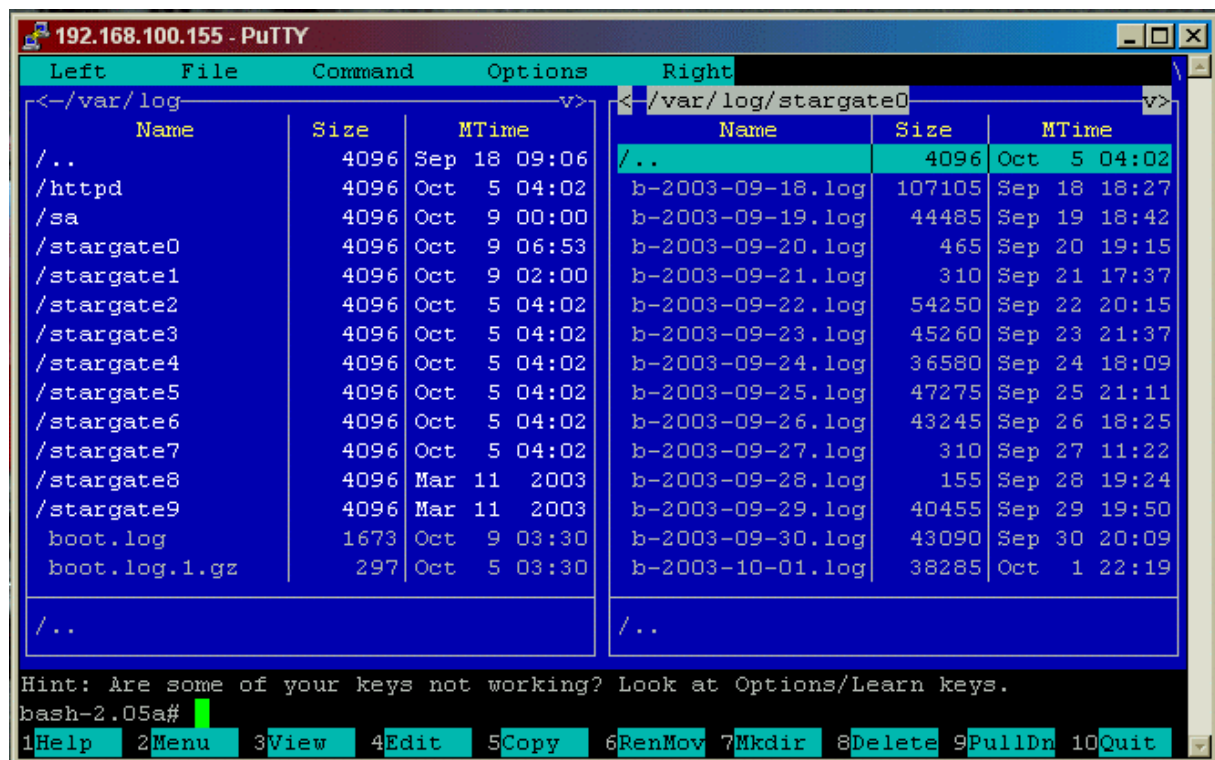


Fig.15: RCU accounting data.

6 Troubleshooting

Installing and configuring a system so as to satisfy the expected functionality is only the part of the show. The real challenge is in keeping the system working. The RCU is no exception in this regard, what is worse, there does not exist a question-answer cook book for solving all the possible combinations of error states that may befall the RCU. A lot depends on the ability of the system administrator to troubleshoot and closely follow all leads towards the resolution of the problem. The following sections elaborate on the tools that can be used in troubleshooting the RCU.

6.1 Stargate Service

The *stargate service* is a set of scripts that control the overall functionality of the RCU system. These scripts include:

| Script | Function |
|----------|---|
| sgethsvr | Communicates with the Stargates by TELNET (Needs Ethernet connectivity) |
| sgagent | Responsible for the automatic download of statuses and CDRs |
| sgtrace | Responsible for the automatic download of traces. |
| sglcr | Takes care of external routing |
| snmpd | Communicates with the management station by the SNMP protocol |

Just like any other Linux script in */etc/rc.d/init.d/*, the stargate service has the following parameters.

- *Status* – whether the Stargate scripts are running or stopped
- *Start* – start the Stargate scripts
- *Stop* – stop the Stargate scripts
- *Restart* – First stops the Stargate scripts and then starts them. Please restart the stargate scripts every time you change the RCU configuration.

Method1:

```
bash-2.05a#  
bash-2.05a# service stargate { status | start | stop | restart }
```

Method2:

```
bash-2.05a#  
bash-2.05a# /etc/rc.d/init.d/stargate { status | start | stop | restart }
```

When the RCU is not working properly, use the stargate service status to check whether all the expected services are running. Do stargate service restart every time you change the RCU configuration.

6.2 Stargate configuration (sgconf)

This script displays the configured Stargates and their corresponding IP addresses.

```
bash-2.05a#  
bash-2.05a# sgconf
```

The output of this command can be used against the pre-installation IP map to check whether the Stargate ordering and configuration are in agreement.

6.3 Checking the Databases

6.3.1 Stargate Databases

The RCU has a total of 21 databases:

- Databases stargate0–9 store status information from Stargates 0-9.
- Databases conf0–9 store web configuration data of Stargates 0-9.
- Routing Database - a database of prefixes for external routing

6.3.2 Stargate Terminal (sgterm)

The sgterm script is used to send AT commands to the individual Stargates from the RCU. A user sitting in the office can connect to the RCU by SSH and use the sgterm to send AT commands to any Stargate connected to the RCU. Sgterm takes the Stargate number (database number) as the first parameter and an AT command as the second one. For instance, to send an AT command to get the processor serial number of the first Stargate (stargate0) you would use the following command:

```
bash-2.05a#
```

```
bash-2.05a# sgterm 0 "ati4"
```

This sends the AT command "ati4" to Stargate0.

If an AT command contains the character "!", please place a "\" before "!".

```
bash-2.05a#
```

```
bash-2.05a# sgterm 0 at!\q
```

This command sends the AT command "at!q" to the Stargate

The Stargate terminal can be used to troubleshoot the databases, i.e., to test whether the databases are updating properly.

6.3.3 Accessing table main

Table below shows the structure of table "main" in databases stargate0-9 and the corresponding AT commands that can be used to crosscheck values of the table fields. This table contains the basic configuration and status information from the corresponding Stargate.

| Id | Description | sgterm 0-9 | Meaning |
|-----------|--------------------------------|-------------------|----------------|
| 0 | Stargate's CPU serial number | ATI4 | |
| 1 | Bootware and Firmware versions | ATI3 | |
| 2 | Stargate IP address | AT&V, S70 | |
| 3 | Stargate IP netmask | AT&V, S71 | |
| 4 | Mode of routing | AT&V, S90 | 0 = cyclic |

| | | | |
|----|--------------------------------------|---------------------|---|
| | outgoing calls (ISDN to GSM) | | 1 = Locked 2 = According to credit |
| 5 | Saving call data CDRs | AT&V, S91 | 0 = no calls 1 = successful outgoing 2 = successful incoming 3 = successful incoming + outgoing 4 = not used 5 = all outgoing 6 = all incoming 7 = all incoming + outgoing |
| 6 | Number of GSM boards in the Stargate | | |
| 7 | Time and date | AT&V, S99 | |
| 8 | PIN | AT&V, S98 | |
| 9 | CPU type | ATI4 | |
| 10 | CPU utilization | AT! P | |
| 11 | Serial port status | | |
| 12 | Ethernet port status | | |
| 13 | Trace mode | AT&V, S92 | 0-32, 1 = layers 3&4, 9 = layers 2,3&4 ... |
| 14 | Type of AUX board | AT&SAX | |
| 15 | Status of AUX board | AT&SAX | |
| 16 | Status of AUX layer 3 | AT&SAX | |
| 17 | Type of PRI board | AT&SPR | |
| 18 | Status of PRI board | AT&SPR | |
| 19 | Mode of PRI interface | AT&VI | TE/S = TE, Slave TE/M = TE, Master NT/S = NT, Slave NT/M = NT, Master QSIG/M = QSIG, Master QSIG/S = QSIG, Slave |
| 20 | TEI Number | AT&VI, I01 | |
| 21 | Not used | | |
| 22 | PRI ISDN layer1 | AT&SPR | Stargate user manual |
| 23 | PRI ISDN layer2 | AT&SPR | |
| 24 | PRI ISDN layer3 | AT&SPR | |
| 25 | Number of current calls | AT&XC, AT&XP, AT&XG | |
| 26 | Max. Number of simultaneous calls | | |
| 27 | PRI reject causes | AT&VI, I05 | |

To retrieve the contents of main for a particular Stargate, you should.

- Connect to database – **psql** db-name (db-name can be one of stargate0-9)

- Display the contents of table “main” ordered by “id” – **select * from main order by id;**

Further useful commands are:

- Exit database - **\q**
- List all the databases in the system - **\l**
- List all the tables in the database - **\d**
- Help! - **\help**
- Export database “db-name” to a file “f-name” – **pg_dump db-name > f-name**

To troubleshoot the databases, retrieve the contents of the databases and check them against the output of AT commands using the sgterm as in the table above.

7 FAQ

Q1: All connected Stargates do not communicate with the RCU

A1: 1-check IP connectivity (ping)
2-make sure that service stargate scripts are running
3-use sgconf to confirm the right configuration and Stargate ordering

Q2: There is IP connectivity but cannot login to the webview

A2: Re-run “webpass” and remember your username and password

Q3: There is IP connectivity but the webview displays “STARGATE NOT CONNECTED”

A1: 1-check 2&3 in Q1
2-check that the serial number of your Stargate CPU is the same as the one at the backside of your RCU CD

Q4: IP connectivity works, but the web view displays “STARGATE NOT CONNECTED” and the log file contains “Call service”

A4: Check which CPU number (STARGATE) is connected to which database and compare it with labels on installation CD.

STARGATE0 = DB0

STARGATE1 = DB1

...

STARGATE7 = DB7

Appendix 1: The Trap Table

| Base OID: | | | | | | |
|--------------------|----------------------------------|----------------------------|--|---|----------|--------------|
| 1.3.6.1.4.1.6530.0 | | | | | | |
| Trap ID | Source MIB Object | Event | Form | The Event Log Message in HP OpenView NNM definition | Severity | Related trap |
| 501 | CPUBoard.Status.SerialPort | a value change to NOK | No response from serial port | No response from serial port | Critical | 502 |
| 502 | CPUBoard.Status.SerialPort | a value change to OK | Serial communication restored | Serial communication restored | Major | 501 |
| 503 | CPUBoard.Status.CPUUtilization | a value increased to > 80 | CPU Utilization : <Source MIB Object Value> | CPU Utilization : \$1 | Major | 504 |
| 504 | CPUBoard.Status.CPUUtilization | a value decreased to < 60 | CPU Utilization : <Source MIB Object Value> | CPU Utilization : \$1 | Warning | 503 |
| 511 | AUXBoard.Type | a value change to NONE | AUX board missing | AUX board missing | Major | 512 |
| 512 | AUXBoard.Type | a value change to <>NONE | AUX board inserted | AUX board inserted | Warning | 511 |
| 513 | AUXBoard.GeneralStatus | a value change to <>OK | AUX board status: <Source MIB Object Value> | AUX board status: \$1 | Major | 514 |
| 514 | AUXBoard.GeneralStatus | a value change to OK | AUX board status: OK | AUX board status: OK | Warning | 513 |
| 521 | PRIBoard.Type | a value change to NONE | PRI board missing | PRI board missing | Critical | 522 |
| 522 | PRIBoard.Type | a value change to <>NONE | PRI board inserted | PRI board inserted | Major | 521 |
| 523 | PRIBoard.GeneralStatus | a value change to <>OK | PRI board status: <Source MIB Object Value> | PRI board status: \$1 | Major | 524 |
| 524 | PRIBoard.GeneralStatus | a value change to OK | PRI board status: OK | PRI board status: OK | Warning | 523 |
| 525 | PRIBoard.Status.Layer1/net | a value change to <>ACTIVE | PRI link unplugged | PRI link unplugged | Critical | 526 |
| 526 | PRIBoard.Status.Layer1/net | a value change to ACTIVE | PRI link plugged in | PRI link plugged in | Major | 525 |
| 527 | PRIBoard.Status.Layer2 | a value change to <>OKEST | Multiple frame Not Established | Multiple frame Not Established | Minor | 528 |
| 528 | PRIBoard.Status.Layer2 | a value change to OKEST | Multiple frame Established | Multiple frame Established | Warning | 527 |
| 529 | PRIBoard.Status.BusyBChanCurrent | a value increased over 26 | Number of busy B channels increased to <Source MIB Object Value> | Number of busy B channels increased to \$1 | Warning | 530 |
| 530 | PRIBoard.Status.BusyBChanCurrent | a value decreased under 27 | Number of busy B channels decreased to <Source MIB Object Value> | Number of busy B channels decreased to \$1 | Warning | 529 |

| | | | | | | |
|-----|--|--|---|--|---------|-----|
| 531 | PRIBoard.Status.BusyBChanCurrent | a value decreased under 3 | Number of busy B channels decreased to <Source MIB Object Value> | Number of busy B channels decreased to \$1 | Minor | 532 |
| 532 | PRIBoard.Status.BusyBChanCurrent | a value increased over 2 | Number of busy B channels increased to <Source MIB Object Value> | Number of busy B channels increased to \$1 | Warning | 531 |
| 541 | GSMBoardTab.GSMBoardEntry.Type | a value change to NONE | GSM board in slot <SlotNumber> missing | GSM board in slot \$1 missing | Major | 542 |
| 542 | GSMBoardTab.GSMBoardEntry.Type | a value change to <>NONE | GSM board in slot <SlotNumber> inserted | GSM board in slot \$1 inserted | Warning | 541 |
| 543 | GSMBoardTab.GSMBoardEntry.GeneralStatus | a value change to <>OK | GSM board in slot <SlotNumber> status: <Source MIB Object> | GSM board in slot \$1 status: \$2 | Major | 544 |
| 544 | GSMBoardTab.GSMBoardEntry.GeneralStatus | a value change to OK | GSM board in slot <SlotNumber> status: OK | GSM board in slot \$1 status: OK | Warning | 543 |
| 551 | GSMMModuleTab.GSMMModuleEntry.Status.SignalLevel | a value change to < -100 | GSM module <ModuleNumber> status: Low signal | GSM module \$1 status: Low signal | Warning | 552 |
| 552 | GSMMModuleTab.GSMMModuleEntry.Status.SignalLevel | a value change to > -95 | GSM module <ModuleNumber> status: Signal OK | GSM module \$1 status: Signal OK | Warning | 551 |
| 553 | GSMMModuleTab.GSMMModuleEntry.Status.Layer1/net | any value change | GSM module <ModuleNumber> Layer1/net status: <Source MIB Object Value> | GSM module \$1 Layer1/net status: \$2 | Warning | 553 |
| 554 | GSMMModuleTab.GSMMModuleEntry.Status.Layer2 | any change between irregular states or between irregular and regular state | GSM module <ModuleNumber> Layer2 status: <Source MIB Object Value> | GSM module \$1 Layer2 status: \$2 | Warning | 554 |
| 555 | NOT IN MIB (1[Num of rejected + Num of failed] / [Total num of calls] in %, on a SIM card - from statistics table in stargateX database) | a value increased over <high watermark defined in trapconf session> | GSM Module <Module Number> SIM card <SIM card number> : Call success rate LOW | GSM module \$1 SIM Card \$2: Call success rate LOW | Major | 556 |
| 556 | NOT IN MIB ([Num of rejected + Num of failed] / [Total num of calls] in %, on a SIM card - from statistics table in stargateX database) | a value decreased under <low watermark defined in trapconf session> | GSM Module <Module Number> SIM card <SIM card number> : Call success rate OK | GSM module \$1 SIM Card \$2: Call success rate OK | Warning | 555 |

